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Citation for published version:

Hernes, MI & Metzger, M 2016, 'Understanding local community's values, worldviews and perceptions in the Galloway and Southern Ayrshire Biosphere Reserve, Scotland.', *Journal of Environmental Management*, vol. 186, no. 1, pp. 12-23. <https://doi.org/10.1016/j.jenvman.2016.10.040>

Digital Object Identifier (DOI):

[10.1016/j.jenvman.2016.10.040](https://doi.org/10.1016/j.jenvman.2016.10.040)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Peer reviewed version

Published In:

Journal of Environmental Management

Publisher Rights Statement:

12 month embargo to be set.

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Title

Understanding local community's values, worldviews and perceptions in the Galloway and Southern Ayrshire Biosphere Reserve, Scotland.

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Abstract

Biosphere reserves have been studied around the world, but methods to elicit community's values, worldviews and perceptions are missing. A greater understanding of these can help avoid tension and improve successful management. This paper used a mixed-methods survey to elicit local community's environmental values, ecological world views and perceptions of the Galloway and Southern Ayrshire Biosphere Reserve (GSABR). Over three weeks, forty participants from three communities of the GSABR responded to a semi-structured mixed-methods survey. The survey revealed that residents of the GSABR greatly value wildlife and beauty of nature, and that the majority of the respondents showed concern for the environment from an ecocentric worldview. Results also revealed that the most influential tested socio-demographic characteristic affecting people's relationship to their environment is their professional affiliation. Tourism and recreation were seen as major benefits of the recent biosphere designation. Results did highlight contrasting benefits from the designation for different stakeholder groups, which could potentially lead to tensions and should be considered in the reserve management. Given the community's supportive world views and perceptions, greater participation in the biosphere's management is likely to be welcomed and should be used to avoid or mediate any conflicts. The mixed-method survey developed for this study, proved successful in eliciting these themes in the GSABR. We recommend other biosphere reserves replicate this research, to gain better understanding of local communities and increase their support and participation in reserve management.

Keywords

Biosphere reserve; environmental value; ecological worldview; perception; participation.

1. Introduction

There is an increased consensus that the effectiveness of protected areas and natural resource management is affected by ways in which local communities relate to their natural environment (Karanth et al., 2008; Wallner et al., 2007). Understanding how people relate to nature by evaluating values and worldviews provides a deeper understanding of perceptions and behaviours towards conservation (Gagnon-Thomson and Barton, 1994, Schwartz, 1994). Consulting local communities, and understanding their views, therefore plays an important role in achieving public acceptance of protected areas, and ultimately in the conservation success (Wallner et al., 2007). As such, a 'bottom up' approach is important to increase the environmental, social and economic sustainability of a locality (Frost, 2001, Wallner et al., 2007). The importance of considering local communities' relationship to their environment is reflected in the causal relationship between values, worldviews and perceptions (Figure 1).

This paper contributes to the study of environmental values, ecological worldviews and public perception of the recently established Galloway and Southern Ayrshire Biosphere Reserve (GSABR). However, the research methods and findings have wider relevance that can help other biosphere reserves and conservations areas to include community values, worldviews and perceptions in their management plans. Specifically, this paper addresses the following research questions (Figure 1):

- Which attributes of the environment do local communities value the most?
- What are the local community's ecological worldviews?
- What are the local community's perceptions of the biosphere reserve designation?

We chose the GSABR for its explicit aim to foster relationships between humans and nature with consideration to economic, social and ecological development (GSABR, 2015). Indeed, this was central to establishing the 'biosphere reserve' concept in 1974 (Frost, 2001; Price, 2002; Price, et al., 2010), as part of the United Nations Educational, Scientific, and Cultural Organization (UNESCO) Man and the Biosphere Programme (MAB).

Over three weeks, 37 face-to-face interview and three email correspondence interviews were undertaken in three towns located in South West Scotland. The study was carried out using a mixed-method format to assess local communities' relationship to the environment and their views on the newly designated biosphere. Values, ecological worldviews and expectations were then statistically compared to socio-demographic variables, while attitudes were analysed through inductive qualitative content analysis.

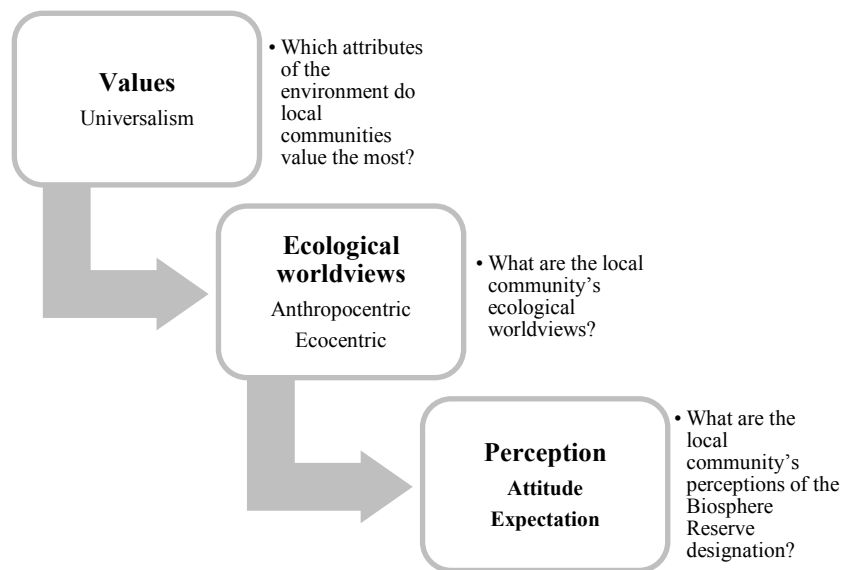


Figure 1 Representation of the four research questions, reflecting the connections between values and decisions. Arrows represent the causal effect between the variables.

2. Theoretical background

2.1. Values, ecological worldviews and perceptions

Values are guiding principles in life, and generally act as the prerequisite to any human action (Gagnon Thomson and Barton, 1994; Lynam, et al., 2007; 1994; Schwartz, 1994; Spini, 2003). Although categorized and theorized in different ways in social sciences (Hitlin & Piliavin, 2004; Rokeach, 1973; Stern and Dietz, 1994), Schwartz (1994) identified ten basic human values that are motivationally distinct, and hence can be used to understand human actions: achievement, benevolence, conformity, hedonism, power, security, self-direction, stimulation, tradition and universalism. The latter relates most to environmental values, which aim at fostering ‘understanding, appreciation, tolerance, and protection for the welfare of all people and for nature’ (Schwartz, 2012).

Ecological worldviews are an individual’s value system in relation to the environment, which constitute one’s beliefs regarding the environment (Brackney and McAndrews, 2001, Dunlap et al., 2000). Gagnon-Thompson and Barton (1994) suggested the distinction between two ecological worldviews: ‘ecocentrism’ and ‘anthropocentrism’. Ecocentric people value nature for its own intrinsic value, whereas anthropocentric people value and wish to protect nature for its positive effects on human lives (Gagnon-Thompson and Barton, 1994). Identifying ecological worldview helps understand why people value the natural environment. Ultimately, this can provide clarity on the reasons for human attitudes and behaviour (Dunlap, et al., 2000; Gagnon Thompson and Barton, 1994).

Perceptions are beliefs or opinions that are often held by many people and based on how things seem (Cambridge Dictionaries, 2015). Here, the term perception is used to describe a local community’s attitudes towards biosphere reserve designation. Attitudes are different from values in that they can be positive or negative, and can be used to describe something

rather specific, like objects, situations or living things (Dietz et al., 2005). Perception is also used to understand a local community's expectations of biosphere management and planning. Evaluating these expectations towards a protected area's management and planning is important to its success, as it can bring insight into the array of existing opinions and ideas related to the scheme (Lynam et al., 2007).

2.2. Biosphere reserves development

Over the past 40 years, the purpose of the MAB programme has gradually evolved beyond conservation aims to establish areas or regions that foster learning, with consideration of environmental issues and integration of environmental sustainability approaches (Habiba et al., 2013). A major shift happened in 1983 at the First International Biosphere Reserve Congress, Minsk (Ishwaran and Persic, 2008) when the 'Action Plan for Biosphere Reserves'. Recommendations were adopted for the protection of ecosystems and sustainable use of resources, as well as the development of three distinct areas (UNESCO, 2014): core areas, which are legally protected and primarily dedicated to conservation; buffer zones, where human activity such as recreation and research take place; and transition zones, where sustainable resource management practices are encouraged and implemented.

Another key event was the Seville International Conference on Biosphere Reserves in 1995, resulting in the creation of the Seville Strategy for Biosphere Reserves. It highlighted the importance of biosphere reserves as places for sustainable development and conservation, as well as for research and learning, 'showing the way to a more sustainable future' (UNESCO, 1995a, p.3). This was an important document, as it was the first to outline the three complementary functions that all biosphere reserves should meet: conservation of resources, species, ecosystems and landscapes; learning and research through education and monitoring; and sustainable economic and human development (UNESCO, 1995a, UNESCO, 2014; Schultz and Folke, 2011). Biosphere reserves complying to these requirements are now considered 'new style biosphere reserves', as opposed to the ones designated prior to 1995, which are known as 'conventional biosphere reserves' (Schultz and Folke, 2011).

Although all the 'new style' biosphere reserves are structured around sustainable development and conservation, their management schemes are highly place-specific, and hence vary widely (Ishwaran and Persic, 2008). Furthermore, because of the multiple interest and objectives of stakeholders from different levels (Reed, 2008), conflicts may emerge in establishment of new designated areas (Wallner et al., 2007). Indeed, the way an area is managed can have important implications on both the landscape and its stakeholders (Wallner et al., 2007).

In their study of three biosphere reserves in Finland, Estonia and Germany, Stoll-Kleemann and Welp (2008) identified fifteen factors contributing to the success of biosphere reserves around the world (Table 1). Although the most influential factor was 'environmental education', several factors relate to public participation: (2) Collaboration with local authorities; (6) Community participation; (7) Leadership; (8) Political support at regional level; (12) Access, equipment and communication; and (13) Consideration of traditional knowledge. One way to reduce the probability of conflicts emerging within a society is by giving consideration to the Participatory Principle (Beder, 2006), the 10th principle of the Rio Declaration on Environment and Development (UN, 1992). As noted by Arnstein (1969, p.216): "Participation of the governed is, in theory, the cornerstone of democracy". Hagget

(2009) shares this view, highlighting that participation and public engagement is a prerequisite to implementing sustainable development, as it helps to overcome the 'democratic deficit' (2009). This is further highlighted by Schultz et al. (2011), who claim that efficiency in the decision making process can be increased by integrating diverse knowledge through public participation, ultimately increasing the legitimacy of the decisions taken.

Table 1 Factors influencing the success of biosphere reserve management. Adapted from Stoll-Kleemann and Welp (2008, p.163)

Rank (level of importance)	Influence factor
1	Environmental education
2	Collaboration with local authorities
3	Long-term research activities
4	Monitoring and evaluation for adaptive management
5	Supportive national conservation policies
6	Community participation
7	Leadership
8	Long-term funding
9	Political support at regional level
10	Well-trained staff and sufficient in number
11	Practical conservation measures
12	Access, equipment, communication
13	Consideration of traditional knowledge
14	Clearly defined responsibilities among governmental bodies
15	Clear boundary demarcation

In the context of biosphere reserves, public participation has become increasingly important (Reed and Massie, 2013; Stoll-Kleemann and Welp, 2000). However, the success of participatory approaches in biosphere reserves has varied for reasons, ranging from the opportunities given to the willingness to participate by the public (Kaltenborn, et al. 1999). Indeed, there have been considerable gaps between the formal vision of including local stakeholders in the decision-making process and actual practice (see Price, et al., 2010; Pujadas and Castillo, 2006; Rao et al., 2006; Xu et al., 2006). On the other hand, good practice and effective community participation has also been documented to lead to success (see Ericson, 2006; Kleemann and Welp, 2000).

2.3. The GSABR

The GSABR received its UNESCO designation in June 2012, becoming Scotland's first and the UK's third, 'new style' biosphere reserve (UNESCO, 2014) (Figure 2). The biosphere received its status based on a nomination by the Scottish Government, and approval by the MAB programme. The latter implies GSABR complies with the Seville Strategy criteria for conservation, education and socio-economic sustainability, fostering a balanced relationship between humans and nature (GSABR, 2014). This is reflected in the GSABR 'Sense of Place Toolkit' (GSABR, 2014), which lists the economic, social and environmental functions and opportunities in a list of sense of place prospects (Table 2).

Table 2 GSABR functions: Sense of place and business opportunities (from GSABR Toolkit, 2014, p.10)

Prospects of the GSABR
Wildlife and beauty. The importance and diversity of the natural environment – from the area’s unique geology and coastline, to its rare and wonderful wildlife, habitats and waterways.
Tranquillity. The area’s unique sense of peace, quiet and remoteness.
Recreation. The abundance of outdoor activities that can be enjoyed locally, including walking, cycling, sailing, fishing, golfing and more.
Local produce. The range of good quality food that is farmed and produced locally, including whisky, shellfish, cheese, ice cream and local brands, such as the distinctive Belted Galloway cows.
Heritage and culture. Exploring the people and events that have shaped the area both past and present – from industrial and religious heritage, to famous connections and local stories.
Inspiration. The importance of the area for inspiring the creative arts, both past and present.

Public consultation (rung 4 on Arnstein’s (1969) ladder of participation) asked residents to describe the landscape they live in prior to the UNESCO designation. And the active GSABR social media website, along with various conferences, fairs, forums, and information sessions meets information provision (rung 3) requirements. However, at the time of our study the local community’s values, worldviews and perceptions were not assessed or used in the biosphere’s decision making processes (Ed Forrest, pers. com., 2014).

The biosphere covers an area of almost 5,200 km² and holds 45,000 dwellings and 95,000 residents. Following the UNESCO’s framework, the GSABR is structured around a core area, buffer zone and transition zone (Figure 2; GSABR, 2014).

3. Methods

3.1. Research approach

In this research, the theory of constructivism was considered by adopting an interpretive position (Schwandt, 1994), also known as the ‘naturalistic’ position (Lincoln and Guba, 1985). This allowed for the assessment of local communities on the basis that reality is socially constructed (Robson, 1993), and that the social interactions can be observed and interpreted in a dynamic and growing way in order to give rise to concepts and theories (Walliman, 2011).

The research was carried out following of a mixed-research format, containing both qualitative and quantitative approaches. The collective case study approach was applied on the basis of three features (Cresswell, 2014; Punch, 2005): the research is a bounded system marked by three selected towns; it represents an in depth study of the GSABR and its establishment; and the study aims at reaching a holistic understanding of how local communities relate to their environment.

3.2. Expert interviews

Three initial semi-structured interviews were held with GSABR experts to refine and frame interview questions. This pilot study aimed at receiving feedback on the content and format of the questionnaire to local communities and well as revealing their perceived attitudes towards the designation of the area into a biosphere reserve. These interviews, lasting between 40 and 80 minutes each, deepened the understanding of the situation.

3.3. Sample design

Stakeholder groups in the GSABR were selected based on a purposive criterion sampling, depending on their relation to the GSABR's complementary functions of conservation, social and economic development. Three groups emerged: conservation groups, tourism businesses, and land-based businesses. Within these, systematic random sampling was adopted to select individual stakeholders, drawing from an alphabetically ordered list. The approach was topped by the snow-ball non-probability sampling technique.

Similarly, study sites (towns) were chosen using the presence of at least five individuals of the three stakeholder groups living within 10 kilometres from the respective town as the criterion. The resulting study sites were three towns: Castle Douglas, Newton Stewart and Girvan. Town locations are depicted in Figure 2, key characteristics are presented in Table 3, and the distribution of interviews classified by towns are found in Table 4.

Resource constraints, limiting the interview period to three weeks in July 2014, determined the sample of 40 interviews. All interviews were carried out by the same researcher to ensure consistency in interviews and maximise validity of the results.

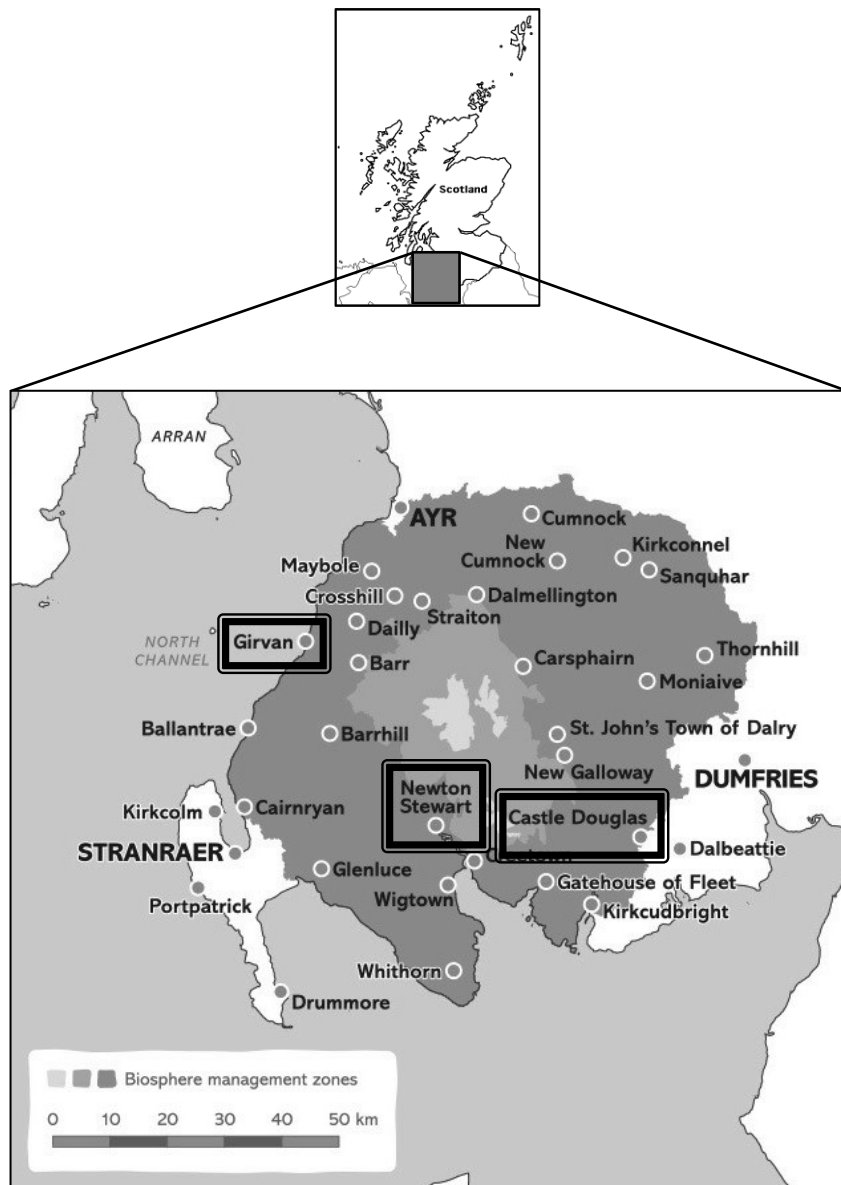


Figure 2 Map of the GSABR, Southwest Scotland, 2015. Showing: i) The main community centres, ii) Three study areas (framed in black), iii) Zoning system. Dark grey = Transition area, Medium grey = Buffer zone, Light grey = Core area. (GSABR, 2014; Enchanted Learning Search, 2015).

Table 3 Towns characteristics (Sources: City Population, 2015; Castle Douglas Food Town, 2014; Wilson and Symington, 2013)

	Castle Douglas	Newton Stewart	Girvan
Area, Council	Kirkcudbrightshire, Dumfries and Galloway	Wigtownshire, Dumfries and Galloway	Carrick, Southern Ayrshire
Demography (2011 Census)	4,174	4,091	6,651
Main feature	Gained the title of 'Food Town' for its high selection of local produces and shopping facilities.	Sometimes referred to as the 'Gateway for the Galloway Hills', it is known for its various hiking and angling opportunities.	Typical camping and resort holiday destination, offering long beaches and hills ideal for outdoor activities.

Table 4 Distribution of interviewed stakeholder groups

Main stakeholder groups	Types	Castle Douglas	Newton Stewart	Girvan	TOTAL
Conservation groups	National public body	2	3	1	13
	Local public body	1		1	
	National charity group		1		
	Environmental consultancy firm	1			
	Local charity group		1	1	
	Club			1	
Land-based businesses	Timber		2		10
	Food	3	1	4	
Tourism businesses	Leisure: Sport	2	2	2	17
	Leisure: Culture	1	1	1	
	Membership group		1		
	Touristic agency			2	
	Hotel, guesthouse	3	1	1	
TOTAL		13	13	14	N = 40

3.4. Survey

A total of 37 face-to-face interviews and three email correspondence interviews were undertaken over three weeks in June 2014 (Table 4). Interviews were questionnaire-based, and contained both qualitative and quantitative questions, along with elements of semi-structured and structured format. This mixed-method design allowed for flexibility and openness in the responses, while keeping a consistent structure through similarly ordered and presented questions throughout all the interviews. The questionnaire, included in Supplementary Material A, was had six main parts with differing assessment techniques:

(1) *Socio-demographics* – To identify basic socio-demographics the questionnaire started with closed-ended questions on gender, age and time of residence in the region, and an open-ended question on professional affiliation.

(2) *Values* – The Pebble Distribution Method (PDM) was used to reveal which environment attribute respondents valued the most. Respondents could distribute 15 points, representing units of ‘value’, to five attributes of the environment that are promoted by the GSABR (GSABR Toolkit, 2014): (i) Wildlife and Beauty, (ii) Tranquillity, (iii) Recreation, (iv) Produce, (v) Heritage and Culture, (vi) Inspiration. PDM is recommend for its simplicity and clarity, and is appropriate where respondents are encouraged to consider, to some extent, the underlying reasons for their answers (Lynam, et al., 2007, Sheil, et al., 2002).

(3) *Ecological Worldviews* – To measure anthropocentric or ecocentric views, the study uses the Revised New Environmental Paradigm (NEP-R) Likert scale designed by Dunlap, et al. (2000). This way of measuring people’s views was originally inspired by the scale developed by Gagnon-Thomson and Barton in 1994. Respondents could choose between five levels of agreement, from ‘strongly agree’ to ‘strongly disagree’, regarding 15 statements about the environment (Table 5). The eight odd items reflected endorsement of the New Environmental Paradigm (NEP), and 7 other even items reflected endorsement to the Dominant Social Paradigm (DSP) (Dunlap, et al., 2000). Within these, the items are divided into five more specific hypothesized facets of the environmental worldviews: the reality of growth (1,6,11), anthropocentrism (2,7,12), nature’s balance (3,8,13), exemptionalism (4,9,14), and the possibility of an ecocrisis (5, 10, 15). The NEP has been used widely (Best and Mayerl, 2013; Casey and Scott, 2006, Carrus, et al., 2005; Dunlap et al., 2000; Hawcroft and Milfont, 2009).

Table 5 Ecological worldview items (Adapted from Dunlap et al., 2000)

Code	Item/Statement	Ecological world view Dimensions
1 (a)	We are approaching the limit of the number of people the Earth can support.	NEP, limits of growth
2 (b)	Humans have the right to modify the natural environment to suit their needs.	DSP, anthropocentrism
3 (c)	When humans interfere with nature it often produces disastrous consequences.	NEP, nature’s balance
4 (d)	Human ingenuity will insure that we do not make the Earth unlivable.	DSP, exemptionalism
5 (e)	Humans are seriously abusing the environment.	NEP, ecocrisis
6 (a)	The Earth has plenty of natural resources if we just learn how to develop them.	DSP, limits of growth
7 (b)	Plants and animals have as much right as humans to exist.	NEP, anthropocentrism
8 (c)	The balance of nature is strong enough to cope with the impacts of modern industrial nations.	DSP, nature’s balance
9 (d)	Despite our special abilities, humans are still subject to the laws of nature.	NEP, exemptionalism
10 (e)	The so-called “ecological crisis” facing humankind has been greatly exaggerated.	DSP, ecocrisis
11 (a)	The Earth is like a spaceship with very limited room and resources.	NEP, limits of growth
12 (b)	Humans were meant to rule over the rest of nature.	DSP, anthropocentrism
13 (c)	The balance of nature is very delicate and easily upset.	NEP, nature’s balance
14 (d)	Humans will eventually learn enough about how nature works to be able to control it.	DSP, exemptionalism
15 (e)	If things continue on their present course, we will soon experience a major ecological catastrophe.	NEP, ecocrisis

(4) *Awareness* – Respondents’ awareness about the GSABR was determined with a simple closed-ended question. When respondents answered no, the interviewer gave a brief summary about the meaning of ‘biosphere reserve’ and the UNESCO recent designation of the area.

(5) *Attitudes* – Questions about attitudes were open-ended, and were directed at evaluating the respondents' attitudes towards the biosphere designation. Attitudes were asked to be expressed as constraints and opportunities, and allowed for an open-ended comment at the end of the section. As opposed to the five other sections of the questionnaire attitudes were tested orally, and recorded when permitted by the respondent. This technique has the advantage of allowing for deeper understanding of a phenomenon while giving freedom of expression (Wallner, et al., 2007).

(6) *Expectations* – A five level Likert-type scale ranging from 'very important' to 'not important' was used to assess management expectations with regards to 15 planned projects and initiatives. Advantages of the Likert-scale technique include the facility and 'flow' in answering the questions and the ease of interpretation; disadvantages include the high subjectivity of the answers, and the difficult interpretation of the middle option 'unsure' (Robson, 1993).

In summary, attitudes and expectations were assessed as a means to define the overall local community perception of newly designated GSABR. Although they vary in the temporal sense of the definition, attitudes and expectations could then be translated into perceptions because they are both products of ways in which people evaluate and experience, in a positive or negative way, a situation, an object or an event (Pickens, 2005, Schwartz, 1994).

3.5. Data analysis

The data for values, ecological worldviews and expectations were statistically tested for correlations to socio-demographic characteristics using the Mann Whitney U test (for gender and awareness), and the Kruskal-Wallis test (for professional affiliation, town of residence, age). These tests were selected because the sets of data are independent the data are ordinal (Bryman, 2004). Significance was set at 95% (0.05); two-tailed tests were adopted with null hypothesis assuming that there were no significant differences between dependent and independent variables. The calculations were carried out in the IBM Statistical Package for Social Analysis (SPSS) software (IBM, 2016).

The data collected for attitudes was assessed through inductive qualitative content analysis (Bryman, 2004), identifying themes that were classified into categories of similar meaning. Comparisons were made between the three stakeholder groups, as opposed to the three other dependent variables tested for the totality of socio-demographic variables. The first reason for this is that the literature revealed various instances of positive correlations between attitudes and personal economic goals (Bonaiuto et al., 2002; Karanth et al., 2008; Stern and Dietz, 1994). The second reason was that by reducing the analysis of the other socio-demographic variables a deepened understanding of the effect of professional affiliation on attitudes could be obtained. Finally, word frequency within transcripts was tested using NVivo Word Frequency tool (QSR International, 2016).

4. Results

4.1. Pilot study

Six main and reoccurring themes of perceived opportunities emerged from the three pilot interviews: conservation, tourism, local produce, local economy, culture and history, international, and national recognition. Furthermore, all three interviewees noted they did not perceive any constraints in the form of added rules or regulations resulting from the biosphere

designation. Interestingly, they also all thought some local residents may think that the designation does cause constraints due to misconceptions. The interviewees also clarified that the GSABR does not have a fixed boundary, and that the core, buffer, and transition zones boundaries are in fact virtual lines.

4.2. Values

PDM results revealed respondents valued ‘wildlife and beauty’ notably more than the five other attributes of the environment, and valued ‘inspiration’ the least (Figure 3). ‘Wildlife and beauty’ had a mean endorsement of 26%, followed by ‘local produce’ (19%), ‘recreation’ (18%), ‘tranquillity’ (16%), ‘heritage and culture’ (13%) and ‘inspiration’ (8%).

The Mann-Whitney U test and the Kruskal-Wallis test showed that values given for ‘wildlife and beauty’ scored significantly higher amongst conservationists ($p=0.009$), and land-based businesses valued ‘local produce’ ($p=0.005$) more than other groups. There was no significant relation for gender, age, town of residence, and time of residence in the region. Supplementary Material B provides the full statistics of the analysis.

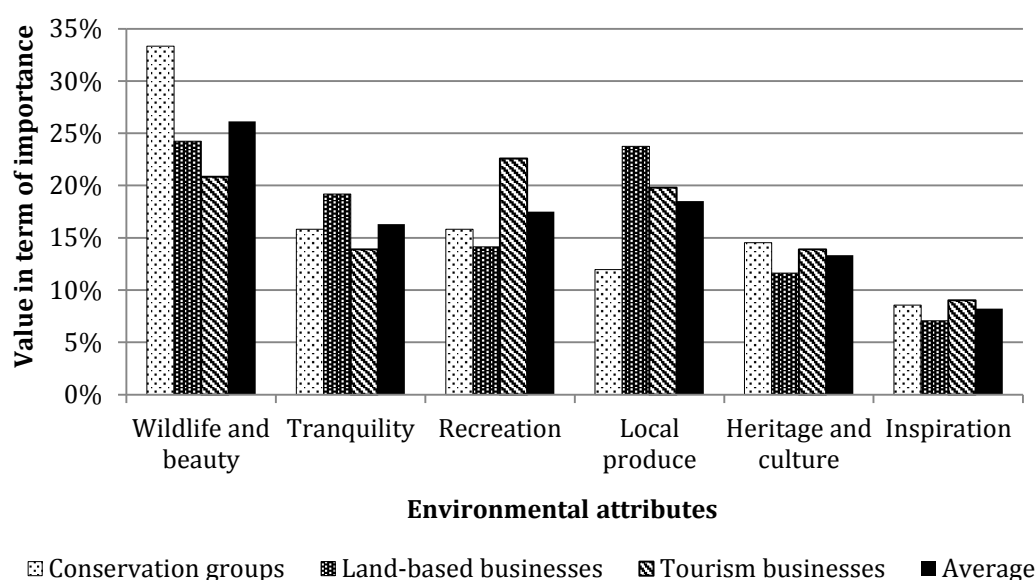


Figure 3 Local residents’ valuation of the six environmental attributes, ordered by professional affiliation. See Supplementary Material B for full statistics of the analysis.

4.3. Ecological worldviews

The NEP scores considerable higher than the DSP (4.06 compared to 2.72; Figure 3). The majority of the respondent therefore value the environment for its intrinsic value, rather than its utility for humans. Within the NEP category, tourism businesses and conservation groups scored highest (4.18 and 4.17 respectively), whilst land-based businesses scored highest within the DSP category (3.86), and conservation groups the lowest (Figure 4). See Supplementary Material C for full statistics of the analysis.

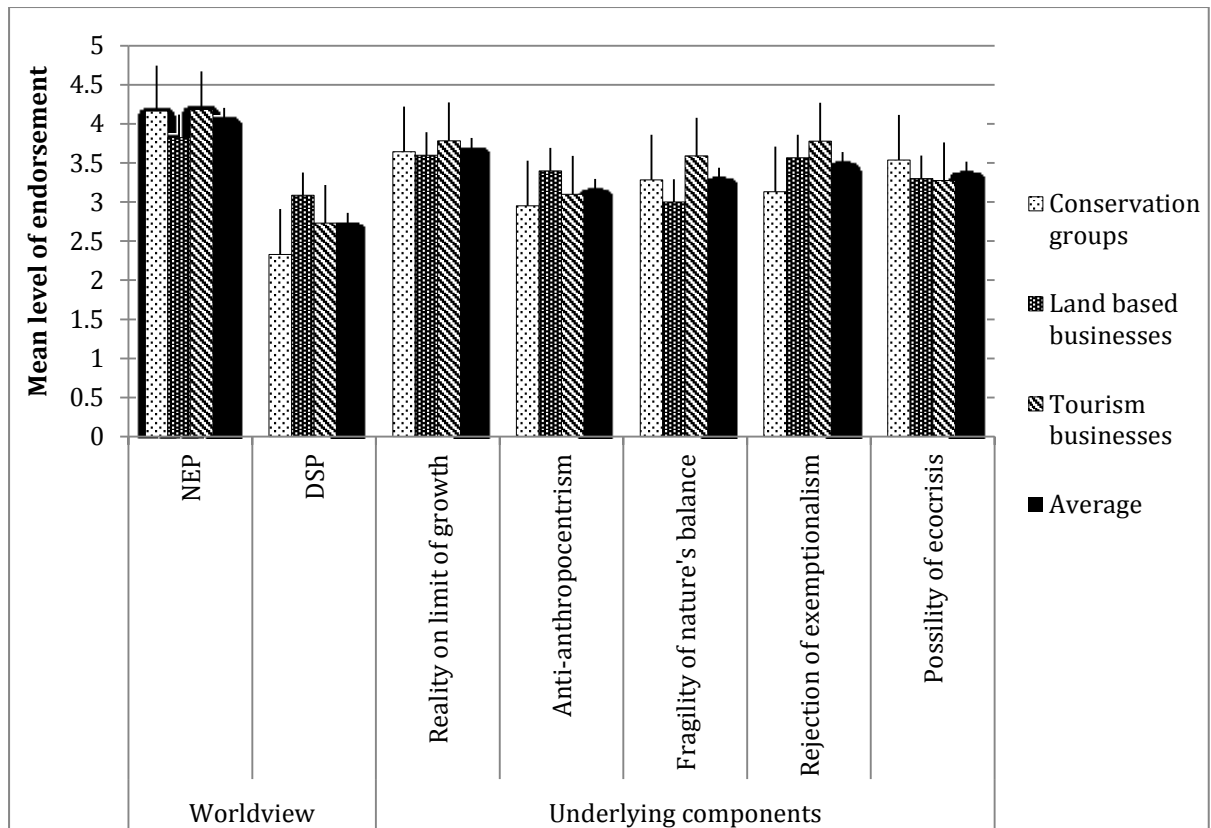


Figure 4 Local residents' ecological worldviews ordered by professional affiliation. The ecological worldview endorsement means were calculated using a Likert-type scale where 'strongly disagree' = 1, 'mildly disagree' = 2, 'unsure' = 3, 'mildly agree' = 4 and 'strongly agree' = 5. Standard deviation (SD) = 0.58 for conservation groups; SD = 0.29 for land-based businesses; SD = 0.49 for tourism businesses.

The two non-parametric tests revealed that socio-economic characteristics have no influence on the respondents' ecological worldviews, or the five underlying ecological worldview dimensions – limit of growth, anthropocentrism, nature's balance, exemptionalism and ecocrisis. However, when testing the effect of socio-demographics on specific statements from the survey, the results show four significant correlations:

- *Statement 5(e) "Humans are seriously abusing the environment".* Although all three professional affiliation groups agreed more to the NEP than the DSP hypotheses, conservation groups agreed significantly more than the two other groups to this statement endorsing NEP and the possibility of an ecocrisis ($p = 0.029$).
- *Statement 8(c) "The balance of nature is strong enough to cope with the impacts of modern industrial nations".* The results showed that professional affiliation affected the respondents view on the fragility of nature's balance ($p = 0.012$). Land-based businesses were the most likely to agree to this DSP and anthropocentric endorsing statement, and conservationists were the least likely to agree with this.
- *Statement 9(d) "Despite our special abilities, humans are still subject to the laws of nature".* In this case, gender seemed to affect views on the rejection of exemptionalism ($p = 0.024$), as females agreed significantly more with this NEP-endorsing statement than men.
- *Statement 12(b) "Humans were meant to rule over the rest of nature".* In line with Statement 8(c) above, land-based businesses endorsed anthropocentrism significantly more than the two other groups, which again contrasted with conservation groups showing significantly less endorsement to the DSP-based statement ($p = 0.044$).

4.4. Perceptions of the GSABR

4.4.1. Perceived opportunities

As the area only received its UNESCO designation in two years before the study, the perceived opportunities and constraints were often referred to as future potential advantages and disadvantages. Supplementary Material D contains the details of the interviews' findings. Overall, the most frequently expressed perceived opportunity is the potential for increased tourism and recreation in the area, as noted by 28.7% of the respondents (Figure 5). This opportunity was most highly endorsed by tourism businesses (mean = 37.5%), as highlighted by this quote from a respondent working in the tourism industry:

'I think, as far as the biosphere reserve goes, what I think would be very good, is to encourage the tourism of the area. Cause a lot of folks come to this area for wildlife tourism. They're coming for the atmosphere of the old history, and the abundance of biodiversity. And there is quite a lot around here' (Participant 6T).

Enhanced conservation was also frequently mentioned as an opportunity for the region, with 20.1% of respondents mentioning it. Conservation groups mentioned this opportunity most often (mean = 29.6%). Various opportunities were noted: to protect forests and rivers, experience tranquillity and peace, and encourage the protection of the environment for future and later generations. A land-based business owner highlighted the benefits of conservation:

'I can see it benefitting me just from the fact that maybe it will preserve some of the landscapes that I love, and some of the biodiversity that I'm interested in you know. So if it protects that, then I'm benefitting.' (Participant 5L).

Other less commonly mentioned opportunities included 'knowledge' (mean = 10.1%), 'international recognition' (mean = 8.3%), 'socio-economic situation' (mean = 8.1%), and lastly 'local produce' (mean = 7.3). On average, 17% of the respondents did not see any potential benefits of the biosphere reserve.

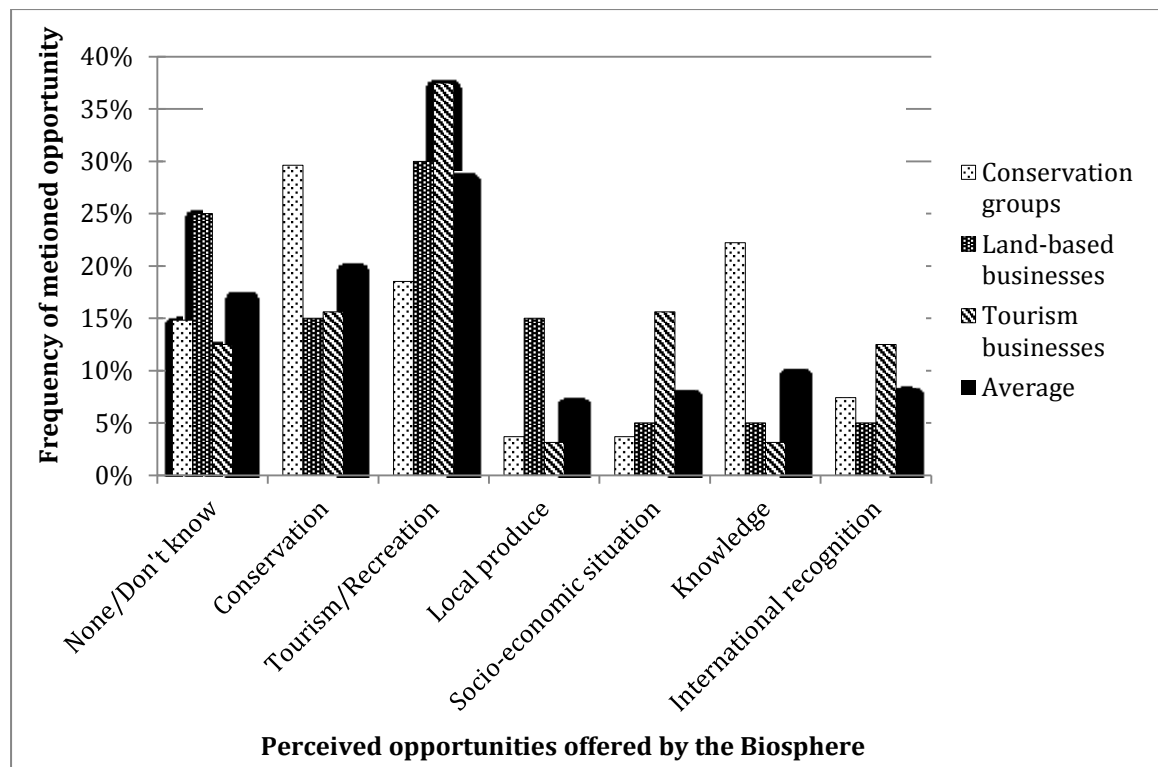


Figure 5 Perceived opportunities by local communities in relation to the designation of the area into a 'biosphere reserve'

4.4.2. Perceived constraints

Overall, only one perceived constrain was commonly mentioned: the increase of regulations and planning constraints (mean = 29.6%, Figure 6). For instance, residents mentioned perceived restraints in relation to national parks, increased barriers in the local economy, increased regulation on water and land use and complications for housing development. As noted by a tourism organisation respondent:

‘There is the worry that the biosphere may cause problems economically, you know, if there are more rules and regulations upon us, little bit like becoming part of a national park.’ (Participant 4T).

Indeed, tourism businesses were the most common to mention potential regulations as a constraints created by the biosphere (mean = 42.9%). Although not being a constraint, by far the most common answer was ‘I don’t know’ or ‘None’ (mean = 57.1%), with land-based businesses scoring higher, followed by conservation groups and tourism businesses. One interviewee also mentioned worries concerning the impact on housing markets, in particular if new incomers buy second homes, affecting prices and availability for long-standing residents.

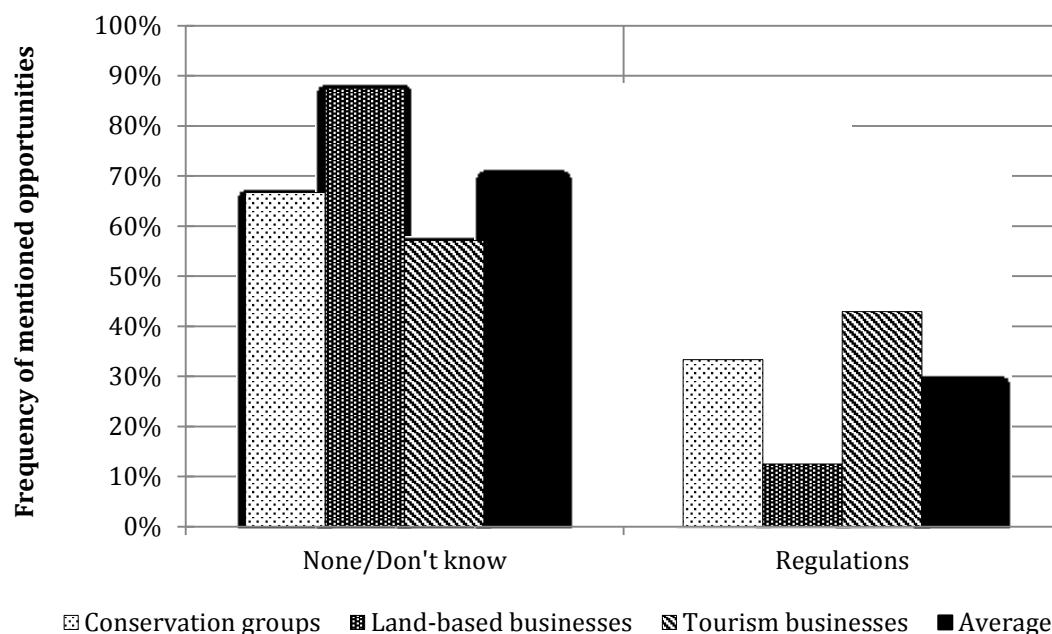


Figure 6 Perceived constraints by local communities in relation to the designation of the area into a ‘biosphere reserve’

The word frequency analysis revealed that the term ‘people’ was mentioned often across all respondents (average weighted frequency = 2.57%). Furthermore, the word frequencies across stakeholder groups reflect the area of interests corresponding to the activities in which they are involved, emphasising their interests and motives in the GSABR. Conservation groups mention ‘nature’ most often (weighted frequency = 0.90%), as well as ‘opportunity’ (weighted frequency = 0.84%). Land-based businesses mentioned ‘Farm/farming/farms’ (average weighted frequency = 2.18%) and ‘conserve’ the most (weighted frequency = 0.71%). Lastly, tourism businesses pronounced most often ‘tourism’ (weighted frequency = 0.57) and ‘develop’ (weighted frequency = 0.48%).

4.4.3. Expectations

Respondents thought most projects and initiatives suggested in the survey were relatively important, assigning scores between 2.94 and 4.47, with an overall mean of 3.9.

Supplementary Material D lists projects and initiatives and highlights the ones deemed most important. Amongst the four projects that scored highest, two are conservation-related (number 2 and 3) and two education oriented (number 1 and 8). A voluntary monetary tax to encourage conservation was considered the least important to local communities (number 10).

Sixteen respondents added suggestions to initiatives that the GSABR should consider in the future, summarised in Table 6. These suggestions mainly involved specific conservation and tourism projects, confirming the importance of these themes.

Table 6 Future project and initiative suggestions by local communities for the GSABR. Themes highlighted in grey were the most often mentioned. Full quotes present in Supplementary Material D.

Suggested project/initiatives	Recurrent themes
1) Long distance paths and series of local paths 2) Adventure and nature tourism markets 3) Creates walks with King Robbert the Bruce historical places 4) Focus specifically on increasing tourism	Tourism and recreation
5) Improve the rivers, mainly the river beds 6) Green tourism 7) Promote natural and native corridors on small and large scale 8) Consider the important acidification problems in the region (it contains 65% of acidification problems) 9) Removal of invasive species e.g. Japanese knot weed	Conservation
10) Encouragement of local knowledge 11) Education program for school for young children 12) Focus on a global information sharing network	Knowledge
13) Promotion of sustainable local involvement from a business perspective 14) Help 'environmental' businesses to develop 15) Wild season initiatives between local authorities and local businesses	Business initiatives
16) Create a landscape with sheep (grazing to keep grass green) and mixed forests (timber extraction), as well as shrubs	Agriculture & Forestry

4.5. Awareness and Town of Residence

Overall, 60% of the respondents claimed to be aware of the existence of the GSABR, either having heard about it briefly, or having gained a thorough knowledge in the topic.

Conservation groups, Girvan residents, females, the age group between 25 and 34 years old and people who have lived in the area only 0-6 years had the greatest awareness. Full data available in Supplementary Material E.

When testing the local residents' values, ecological worldviews and expectations across Castle Douglas, Newton Stewart and Girvan, results revealed that no significance difference was found across the three communities. Full details found in Supplementary Material B and Supplementary Material C.

5. Discussion

5.1. The survey

Using a mixed methods approach in the questionnaire (Supplementary Material A) provided a balanced structure to gather as much background information as possible through closed-ended questions, while also allowing respondents to share personalized views and honest answers through open ended questions. Furthermore, the variation between oral and written answers, allowed for an interaction between the respondent and the interviewer, which helped

ensure concise answers. It also provided a safe environment to discuss in more detail the sometimes controversial topics. And although jargon was avoided, the interaction with the interviewer allowed any confusing terminology to be explained. As such the survey format was successful and can be adapted for other biosphere reserves.

The sampling methodology also worked well, and response rate (58%) was good, although a larger sample size would have strengthened the statistical analysis. Farmers had the lowest response rate, but this is likely due to the timing of the survey. In June they had to prioritise their work on the land. Supplementary Material E give a detailed breakdown of the responses. Timing of future surveys should take stakeholders activities into account.

5.2. Local values, worldviews and implications for the GSABR

The overall findings showed that GSABR communities value ‘wildlife and beauty’ most, followed by ‘local produce’. The attribute of wildlife and beauty, valued the most across all three professional affiliations can be associated to Schwartz’s (1994) ‘universalistic values’, which indicate care for the environment, beauty and unity with nature (see also Schultz and Zelezny, 1999). This high valuation of wildlife and environmental beauty by the local communities, in addition to the high importance given to ‘local produce’, shows the existence of a connection to the local environment.

Assessing ecological worldviews has helped unravel the underlying reasons for valuing the environment. Although no significant differences across groups were found, higher agreement to the NEP/pro-ecological worldview over the DSP/society-centred worldview was found across professional affiliations. This suggests that the majority of respondents had the pro-ecological beliefs that human well-being and environmental health are linked, as well as the importance of balance between environmental protection and economic growth for humans and nature to live in harmony (Dunlap, et al., 1978). These findings were also seen in the wider literature, where NEP was the most frequently endorsed ecological worldview, e.g. by Dunlap and Van Liere (1978) and Dunlap et al. (2000) in Washington State, and by Casey and Scott (2006) in Australia.

Overall, the local population shows to be environmentally conscious and appreciative, and values nature for its intrinsic value. These trends fall in line with the biosphere’s goals of fostering harmonious relationships between humans and nature, and confirms the opportunity that this area presents in enforcing sustainable living.

5.3. Local perceptions and implications for the GSABR

Although respondents personally valued the natural environment the most, they mentioned recreation and tourism the most in terms of perceived opportunities, associating this to increased economic and employment opportunities. Similar findings were revealed in Ite and Adams’ work on conservation and development in Nigerian Cross River National Park (2000). These results can be explained by the overall regional economic situation which was often described as deprived.

The only and main perceived constraint was the addition of regulations and planning restrictions in the area. This falls in line with Wallner, et al. (2007), who found that one of the main perceived effects of the studied biospheres were possibility restrictions in land use. Gorner and Cihar (2013) also found perceived constraints, but more focused, and in relation

to the waste management, forest and development infrastructure, the final two of which were found in the GSABR case as well.

As predicted by the GSABR experts, one factor affecting the answers was the ways in which the resident perceived and understood the meaning of 'biosphere reserve'. Content analysis indicates that the term is widely misunderstood, which in some instances could form a catalyst for negative attitudes. For instance, negative attitudes were suspected to be the result of associating the 'biosphere reserve' to 'national parks', as one respondents used the example of the Cairngorm National Park with its housing restrictions and excessive tourism to illustrate their point (Participant 5C) and two others associated the GSABR to a national park (Participant 4T and 5L). Conversely, the lack of understanding of the biosphere concept also leads to a positive attitudes, as respondents sometimes associated the biosphere with other projects in the area, such as the Dark Sky project (designated two years before the GSABR) (Participant 5L and 6L). Here, respondents noted its success, and related it to potential economic benefits the biosphere may attract.

Implications of the perceptions are mainly two-fold. Firstly, it will be important to consider the wider setting in which the local communities live and work, and the benefits that are received by the different groups. As interviews revealed – farmers are more commonly subsidised, whilst small businesses struggle to find funding. As discussed by Reed (2008), conflicts may arise between stakeholders showing different interests and holding different stakes in the landscape. Furthermore, the inequality in subsidy distribution affects the behaviour towards the environment: farmers receive subsidies to show positive attitudes by reducing impact on wildlife. Conversely there are far fewer incentives for small business to act in an environmentally friendly manner.

Secondly, GSABR should develop strategies to increase the local understanding of the biosphere. This could be achieved first and foremost by increasing local awareness and participation. We discussed already how public participation can minimize conflict in a community, and has proven successful in various biospheres (see Ericson, 2006; Kleemann and Welp, 2000). Educational projects, such as the Nith Fisheries Trust educational programme, have already been set up as part of school curriculums in GSABR. The biosphere reserve should therefore continue to develop strategies to build and strengthen awareness through different means of communication, including regular mail as well as through electronic means to reach a wide range of stakeholders.

5.4. From values and worldviews to behaviour

Values have been defined as a prerequisite for behaviour (Gagnon-Thomson and Barton, 1994; Schwartz, 1994; Spini, 2003). Assessing ecological worldviews has proven useful when unravelling the underlying reasons for valuing the environment. The most influential variable (i.e. that most frequently showed significant correlations) in our study was professional affiliation. The influence could be explained by the fact that this is the socio-demographic variable that best reflects the 'stakes' each individual has in a landscape.

Conservation groups valued 'wildlife and beauty' significantly more than the two other groups, and showed concern for the environment by scoring highest on the NEP scale. This is consistent with several studies revealing positive correlation between environmental values and determining pro-environmental attitudes (Best and Mayerl, 2013; Gagnon-Thompson and

Barton, 1994; Kaiser and Shimoda, 1999). Hence, the choice to work in conservation reflects the inner values of these stakeholders.

By contrast, land-based businesses valued local produce significantly more than the two other groups, and overall agreed more with DSP associated statements about the environment. Indeed, although land-based businesses care for nature, as revealed in the interviews, they also have a business to run, which directly relies on the earth's natural resources.

Tourism businesses take a place in the middle ground. The non-correlation to any attribute by tourism businesses could be explained by the fact that they juggle with different environmental attributes to run their businesses. Tourism businesses require different resources – nature, local produce, tourism itself. For example, a hypothetical outdoor sport company relies on a healthy and tranquil environment and advertises the area's cultural heritage and recreation, but also requires customers and a sound marketing and business strategy in order to be thrive in the environment.

6. Conclusion

Biosphere reserves have been studied around the world, but methods to elicit community's values, worldviews and perceptions are missing. The mixed-methods survey presented here proved successful in understanding the local community's values, worldviews and perceptions in the GSABR and could be readily adapted to other regions. Despite a modest sample size (n=40), the results revealed that local communities in the GSABR value their natural environment, and mostly support the 'New Ecological Paradigm', i.e. valuing the environment for its intrinsic value. Recreation and tourism are seen as important benefits of the biosphere designation. These results suggest a general willingness to maintain and improve their environment, and point to considerable support for the biosphere's ambitions, despite moderate awareness. Professional affiliation does influence the results, and potential conflicts were identified, e.g. between farmers receiving environmental subsidies, others who are expected to comply without financial incentives. Our findings suggest the local community would welcome increased participation in the biosphere management, whilst emphasising the importance of careful consideration of the biosphere's benefits for different stakeholder groups. We recommend other biosphere reserves replicate this research, to gain better understanding of local communities and increase their support and participation in reserve management.

Acknowledgements

The authors would like to thank Ed Forrest, Chris Miles, Simon Fieldhouse, and Dr Steven Gillespie for their great support and thoughtful contribution to the research. The authors would also like to thank all interviewees who took part in the face-to-face surveys and respondents to email surveys. MJM received funding from the European Commission Seventh Framework Programme under Grant Agreement No. FP7-ENV-2012-308393-2 (OPERASs). This paper is based on MIH's dissertation for the MSc Environmental Sustainability.

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